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US ARMY TEST AND EVALUATION COMMAND
TEST OPERATIONS PROCEDURE

DRSTE-RP-702-101

*Test Operations Procedure 2-2-602

AD No.

8 August 1980

ACCELERATION; MAXIMUM AND MINIMUM SPEEDS

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1. SCOPE. This TOP describes how tracked- and wheeled-vehicle-acceleration and minimum- and maximum-speed tests are conducted. The conditions for the tests are also detailed.

2. FACILITIES AND INSTRUMENTATION.

2.1 Facilities.

<u>ITEM</u>	<u>CHARACTERISTICS</u>
Hard-surfaced, straight road at least 2 km long	Level, bituminous or concrete

*This TOP supersedes MTP 2-2-602, 23 March 1966.

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2.2 Instrumentation.

<u>ITEM</u>	<u>MAXIMUM PERMISSIBLE ERROR OF MEASUREMENT*</u>
Speed-measuring device	± 0.2 km/hr, or ± 0.2 mph
Engine tachometer	$\pm 0.5\%$ of full-scale range
Timing device as appropriate	± 0.1 sec.
Recording device as required	System dependent

*Values may be assumed to represent ± 2 standard deviations; thus, the stated tolerances should not be exceeded in more than 1 measurement out of 20.

3. PREPARATIONS FOR TESTS.

3.1 Vehicle Preparations.

a. Prepare the engine, transmission, and when applicable, the governor, for maximum performance per vehicle specifications.

b. Make all pertinent adjustments, such as brakes, throttle linkage, track tension, tire inflation, ignition timing, etc., to comply with specifications.

c. Lubricate all components with the proper quantity and grade of lubricant, and maintain proper levels throughout the tests.

d. Load the vehicle with its normal payload or combat weight. Actual or simulated payload weight shall be prepared in advance.

e. Engine, transmission, and vehicle preparations mentioned above do not apply when the vehicle is being tested in an "as received" condition, or when the effect of completed durability operation on speed and acceleration is desired.

3.2 Instrumentation. Install the speed-measuring device, engine tachometer and suitable timing devices.

4. TEST CONTROLS. Observe the following test restrictions:

a. The road surface shall be smooth and hard-surfaced.

b. The grade shall be minimal (0 to 1%).

c. There shall be no precipitation or foreign matter on the road surface.

d. Wind speed shall not be more than 3.2 km/hr (2 mph) if a cross-wind, and not more than 1.6 km/hr if blowing with or against direction of movement.

e. Operate the test item a minimum of one-half hour prior to test to ensure normal, component-operating temperatures.

5. PERFORMANCE TESTS.

5.1 Acceleration Tests.

NOTE: For vehicles that are required to tow a trailer, this test will be performed with and without a fully payloaded trailer,

5.1.1 Methods. Determine full-throttle acceleration under the following conditions:

a. From a standing start, with engine idling, to maximum road speed in each gear or range (or from minimum speeds in the higher gears when torque is insufficient for a standing start). Record time versus vehicle speed at suitable road-speed increments over the operating speed range in each gear to define the characteristic curve.

b. From a standing start, with engine idling, to maximum road speed while shifting only through gears that permit maximum speed to be reached in the shortest possible time. Record time versus vehicle speed at suitable road-speed increments over the operating speed range in each gear to define the characteristic curve.

c. From one predetermined road speed to another, the exact conditions depending upon the type of vehicle being tested. ^{1/} Record time versus vehicle speed at suitable road-speed increments over the operating speed range in each gear to define the characteristic curve.

d. Make test runs in both directions to negate wind conditions, and make sufficient trials to assure a reliable average value for measurements.

5.1.2 Data Required. Record data as stated in Paragraph 5.1.1.

NOTE: Acceleration time shall be measured from the instant vehicle motion begins. If system-response lag is significant, acceleration time should also be measured from the instant the accelerator is moved.

^{1/} This subtest is not essential to every test program, but may be conducted at the discretion of the evaluator.

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5.2 Maximum- and Minimum-Speed Tests.

NOTE: For vehicles that are required to tow a trailer, this test will be performed with and without a fully payloaded trailer.

5.2.1 Method for Maximum Speed.

- a. Set the vehicle to full throttle in the lowest gear or range to obtain maximum speed in that gear.
- b. With the vehicle in motion, set the vehicle to full throttle in the next higher gear or range to obtain maximum speed in that gear.
- c. Repeat above until all gears or ranges have been tested.
- d. Repeat procedures with the vehicle moving in the opposite direction.

5.2.2 Method for Minimum Speed.

- a. Set the vehicle to part throttle in the highest gear or range and adjust throttle until minimum speed in that gear is obtained.
- b. With the vehicle in motion, set the vehicle to part throttle in the next lower gear or range to obtain minimum speed in that gear.
- c. Repeat until all gears or ranges have been tested.
- d. Repeat procedures with the vehicle moving in the opposite direction.

NOTE: Minimum speeds are the lowest speeds compatible with smooth engine performance in any given gear or range.

5.2.3 Data Required. Record the following for each measurement taken:

- a. Gear or range.
- b. Maximum road speed (km/hr) and engine speed (rpm) obtained for each gear or range in each direction.
- c. Minimum road speed (km/hr) and engine speed (rpm) obtained for each gear or range in each direction.

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6. DATA REDUCTION AND PRESENTATION.

6.1 Acceleration Tests. The average of the data obtained shall be plotted as time (seconds) versus speed (kilometers per hour) as illustrated in Figure 1.

NOTE: Points for which the engine speed exceeded maximum-rated rpm shall be re-run at maximum-rated speed.

6.2 Maximum- and Minimum-Speed Tests. The two readings for each gear or range (one in each direction) for both maximum and minimum speed shall be averaged and presented as the maximum and minimum speed for the individual gear or range.

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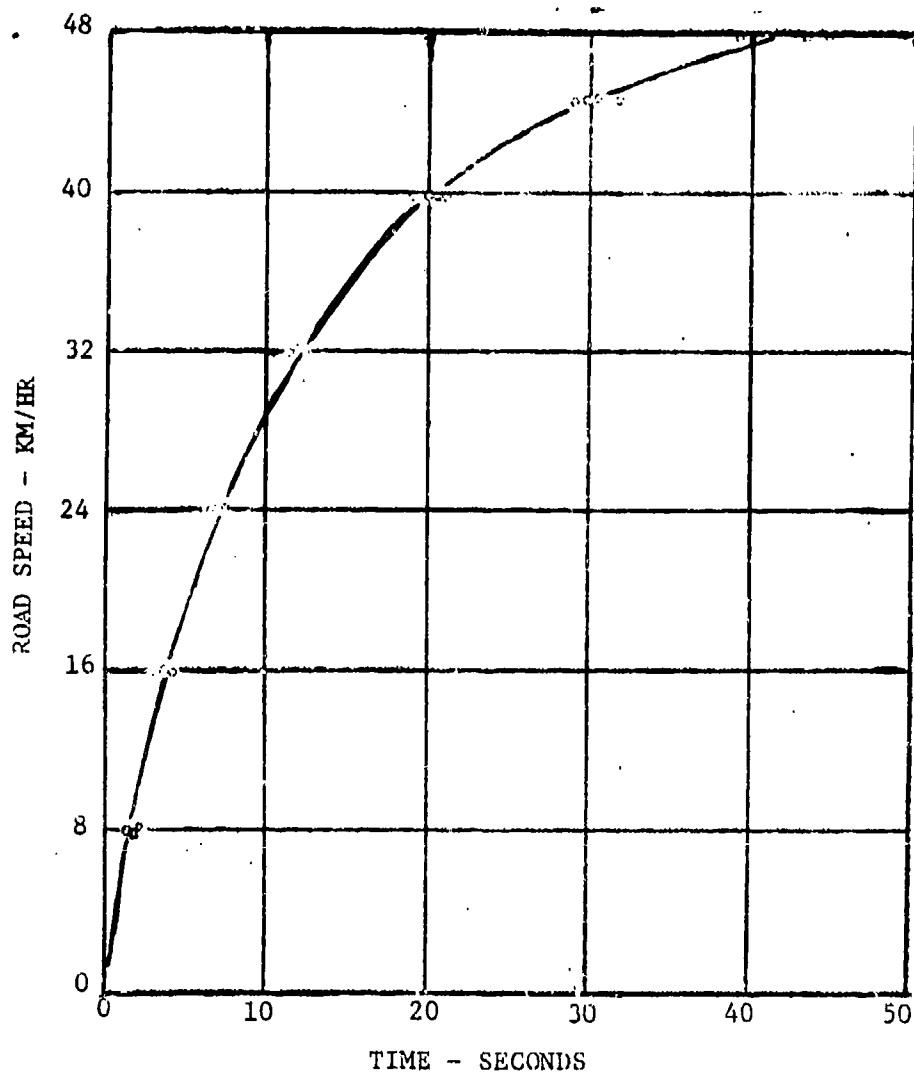


Figure 1. Acceleration (Time-Velocity) Characteristics.

SUPPLEMENTARY

INFORMATION

US ARMY TEST AND EVALUATION COMMAND
Aberdeen Proving Ground, Maryland 21005

AD-A091708
TOP 2-2-602
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Change 1

28 January 1981

ACCELERATION; MAXIMUM AND MINIMUM SPEEDS

TOP 2-2-602, 8 August 1980, is changed as follows:

1. Remove pages and insert new pages as indicated below:

Remove pages--

3 and 4

Insert pages--

3 and 4

2. A vertical line in the left margin indicates the changed portion of the revised pages.
3. Attach this sheet to the front of the reference copy for information.

28 January 1981

d. Wind speed shall not be more than 10 km/hr (6 mph).

e. Operate the test item a minimum of one-half hour prior to test to ensure normal, component-operating temperatures.

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d. Make test runs in both directions to negate wind conditions, and make sufficient trials to assure a reliable average value for measurements.

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- b. With the vehicle in motion, set the vehicle to full throttle in the next higher gear or range to obtain maximum speed in that gear.
- c. Repeat above until all gears or ranges have been tested.
- d. Repeat procedures with the vehicle moving in the opposite direction.

5.2.2 Method for Minimum Speed.

- a. Set the vehicle to part throttle in the highest gear or range and adjust throttle until minimum speed in that gear is obtained.
- b. With the vehicle in motion, set the vehicle to part throttle in the next lower gear or range to obtain minimum speed in that gear.
- c. Repeat until all gears or ranges have been tested.
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NOTE: Minimum speeds are the lowest speeds compatible with smooth engine performance in any given gear or range.

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- b. Maximum road speed (km/hr) and engine speed (rpm) obtained for each gear or range in each direction.
- c. Minimum road speed (km/hr) and engine speed (rpm) obtained for each gear or range in each direction.